

ORIGINAL ARTICLE

Two new species of the subgenus *Cardiobioramix* Kaszab from China (Coleoptera: Tenebrionidae: *Bioramix*)

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Abstract Two new species, *Bioramix* (*Cardiobioramix*) *globipunctata* **sp. nov.** and *B. (C.) liupanshana* **sp. nov.**, were discovered on Mt. Liupan in Ningxia, China. A checklist and a key to the known Chinese species of the subgenus *Cardiobioramix* are provided.

Key words Tenebrionidae, Platyscelidini, *Bioramix* (*Cardiobioramix*), new species, China.

1 Introduction

The subgenus *Cardiobioramix* of the genus *Bioramix* was erected by Kaszab (1940) based on *Bioramix asidioides* Bates, 1879 as type species. It is identified by the following characteristics: prosternal process incompletely curved downwards in ventral view, apex sharp or obtuse; or prosternal process completely curved, but lateral margins of pronotum not flattened and depressed (Kaszab, 1940). Before this study, this subgenus comprises 22 species or subspecies worldwide (Egorov, 2004, 2009), of which 9 species are recorded from China (Bates, 1879; Reitter, 1891; Schuster, 1923; Kaszab, 1940, 1960; Egorov, 2006). In this study, two new species are described as new to science. A key to the species of *Cardiobioramix* in China is provided.

2 Materials and methods

The specimens were examined and illustrated under a Nikon SMZ800 stereomicroscope equipped with a camera lucida. Illustrations were processed using the software CorelDRAW X2. Male genitalia were cleared with a 5% NaOH solution for eight minutes under a water bath. The measurements and habitus photographs were taken using a Leica M205A stereomicroscope.

Measurement of body parts and puncture density were mainly performed following the method used by Li *et al.* (2013). The terminology follows Egorov (2006a).

The holotype and paratypes are deposited in the Museum of Hebei University, Baoding, China (MHBUS).

3 Taxonomy

Bioramix (*Cardiobioramix*) *globipunctata* **sp. nov.** (Figs 1–11, 21–22, 25–27)

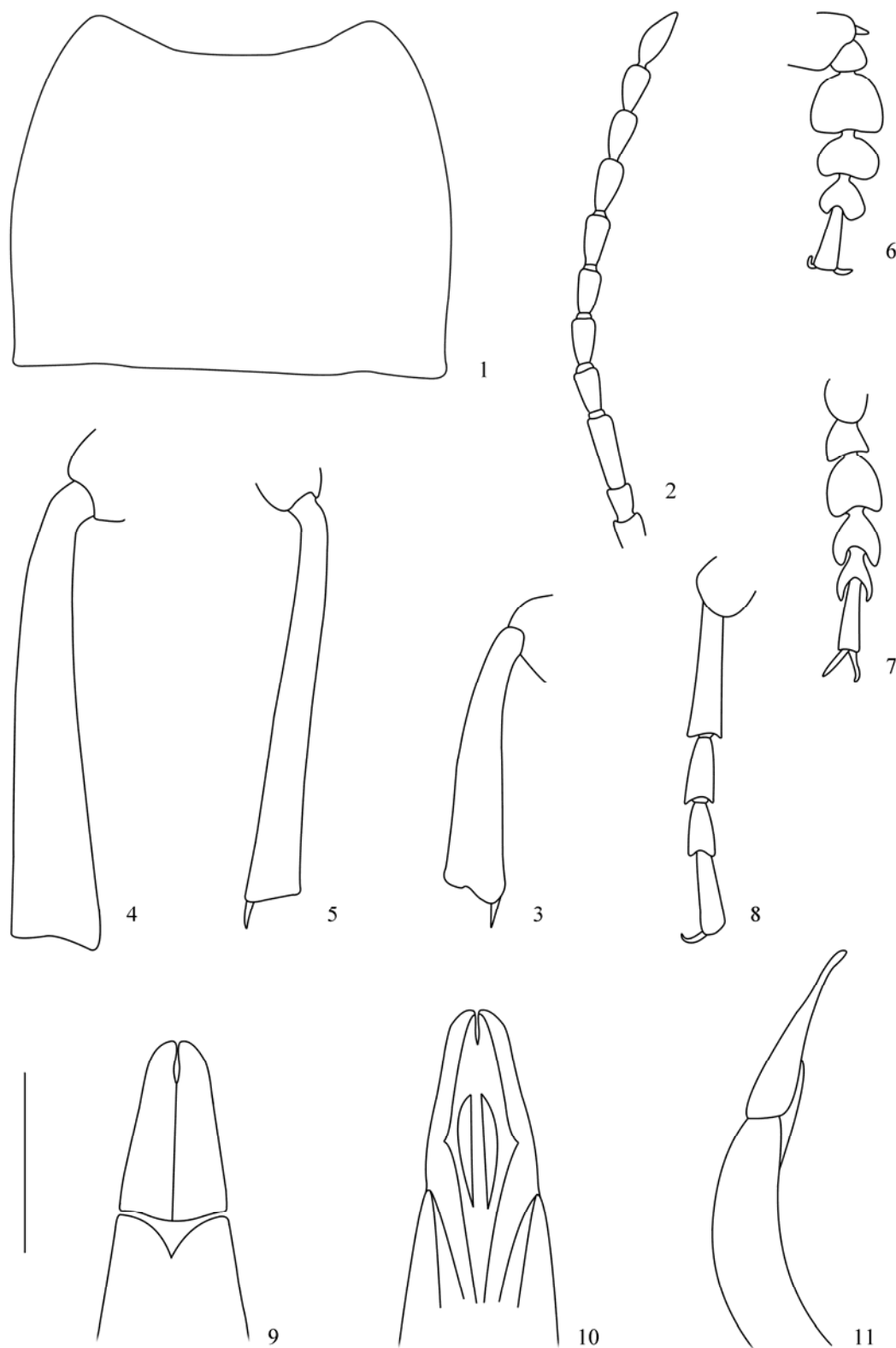
Diagnosis. The new species is similar to *B. (C.) championi* (Reitter, 1891) but can be distinguished by the following

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characteristics: pronotum and elytra densely covered with long golden setae, whereas setae are dust-like in the latter species; pronotum widest in the middle, anterior angles acute, and posterior angles rectangular, whereas pronotum widest in the middle or before the middle in the latter species, anterior angles acute, and posterior angles sharp or acute; striae



Figures 1–11. *Bioramix (Cardiobioramix) globipunctata* sp. nov., male. 1. Pronotum, dorsal view. 2. Antenna, dorsal view. 3–5. Pro-, meso- and metatibia, dorsal view. 6–8. Pro-, meso- and metatarsi, dorsal view. 9–11. Aedeagus in dorsal, ventral and lateral view. Scale bars: 1–8 = 1.0 mm; 9–11 = 0.5 mm.

punctures on elytra incomplete, whereas complete in the latter; the groove of the paramere from apical to base by the dorsal view weakly highlighted by the ventral view, whereas the groove of the latter extends only to 1/3 of the base, distinctly highlighted by the ventral view.

Description. Length 10.9–12.2 mm, width 3.7–5.7 mm. Body brown with weak bronze shine; head and pronotum black-brown, legs, antennae, labial and maxillary palpi and abdomen sepia; elytra with strong bronze shine.

Male (Figs 1–11, 21). Anterior margin of clypeus straight, clypeofrontal suture slightly concave, densely covered with fine punctures. Frons weakly convex, sparsely covered with fine punctures. Genae slightly and arcuately convex and densely covered with large punctures. Clypeus, frons, genae and vertex densely covered with recumbent long golden setae. Eyes transverse. Antennae (Fig. 2) exceeding the base of pronotum, antennomeres II–X long cylindrical and slightly expanded apically, XI pear-shaped, ratio of length (width) of antennomeres II–XI as follows: 20.2 (13.9), 15.9 (15.4), 31.9 (16.0), 33.0 (13.9), 33.2 (14.5), 35.1 (15.0), 35.8 (13.8), 32.4 (15.7), 31.3 (13.9), 39.0 (13.9).

Pronotum (Fig. 1) sub-rectangular, 1.5 times as wide as long, widest in the middle, and 1.7 times as wide as the head; densely covered with long golden setae. Ratio of pronotal width on anterior margin to the maximum width and to the width at posterior margin as 1.7:2.7:2.6; lateral sides have shallow depression before posterior angles, and distinctly constricted anteriorly at apical 1/2. Anterior margin distinctly concave, posterior margin almost straight. Anterior angles acute and posterior angles rectangular. Anterior and posterior margins bordered on both sides, lateral margins bordered along the whole length; disc punctures large and dense.

Elytra oblong, strongly convex, 1.4 times as long as wide, and 1.4 times as wide as pronotum; widest in the middle; disc fine wrinkles, punctures large and dense; lateral carina visible in dorsal view only anteriorly, combined with epipleura and reaching the sutural angle; humeri rounded, densely covered with long golden setae.

Propleura covered with longitudinal wrinkles and recumbent golden setae. Prosternal process slightly curved downwards in ventral view, slightly sharp and rectangular at apex. Pro- and mesosterna covered with recumbent golden setae.

Profemur strong, sparsely covered with punctures and recumbent golden setae. Protibia gradually widened apically; inner side slightly curved, densely covered with recumbent short golden setae at apical 1/2; apex of ventral side without depression; outer side not blade-shaped. Protarsus distinctly widened apically, wider than the apex of protibia. Meso- and metafemora slender. Mesotibia gradually widened apically, densely covered with recumbent golden setae. Mesotarsus slightly widened apically, narrower than the apex of mesotibiae. Metatarsus almost straight, densely covered with recumbent golden setae. Ratio of length (width) of pro-, meso- and metafemora is 2.2 (0.7):2.2 (0.5):2.7 (0.5), that of tibiae (Figs 3–5) is 1.7 (0.3):1.8 (0.3):2.7 (0.4), that of tarsi (Figs 6–8) is 1.4 (0.5):1.6 (0.4):2.0 (0.2); ratio of width (length) of pro-, meso- and metatarsomeres I–IV, respectively, as follows: 24.0 (13.9):45.6 (37.8):38.5 (27.5):27.6 (21.9); 29.9 (18.7):36.2 (34.1):30.2 (28.4):21.6 (18.3); 21.4 (73.2):19.6 (40.3):17.1 (29.5):55.0 (16.0).

Abdomen sparsely covered with recumbent golden setae, anterior margin of visible sternum I wide and round, apical margin of visible sternum V wide and round, center of I–II flattened.

Aedeagus (Figs 9–11) length 1.6 mm, width 0.5 mm. Parameres widest at base, constricted nearly straight at anterior, round and straight at apex.

Female (Fig. 22). Body wider than male. Antennae shorter, reaching posterior to pronotum. Pronotum more transverse than male, approximately 1.6 times wider than long. Pro- and mesotarsi simple.

Body length 13.2 mm, width 6.6 mm.

Type material. Holotype ♂ (MHBU), China, Ningxia, Jingyuan, Qiuqianjia, 7.VII.2009, leg. Xiaoqing Liu. Paratypes. 1♀ (MHBU), same data as holotype; 1♀ (MHBU), China, Ningxia, Jingyuan, Erlonghe, 23.VI.2008, leg. Hongfan Ran; 1♂ (MHBU), China, Ningxia, Jingyuan, Dongshanpo, 18.VII.2014, leg. Ling Bai.

Etymology. The specific name is derived from the Latin *cyclo-* and *punctatus*, referring to the round punctures on the pronotum.

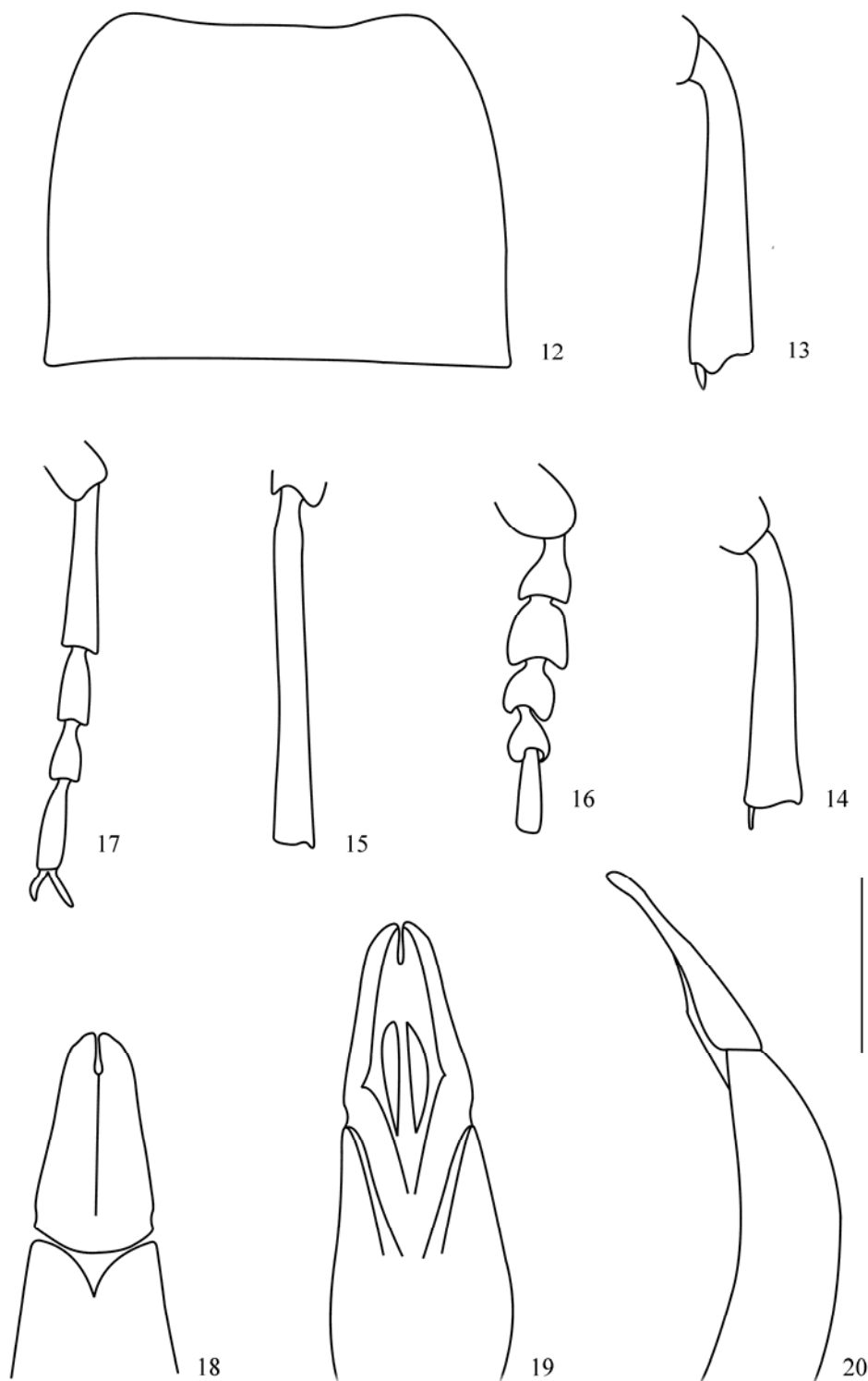
Distribution. China (Ningxia).

***Bioramix (Cardiobioramix) liupanshana* sp. nov.** (Figs 12–20, 23, 24, 28–30)

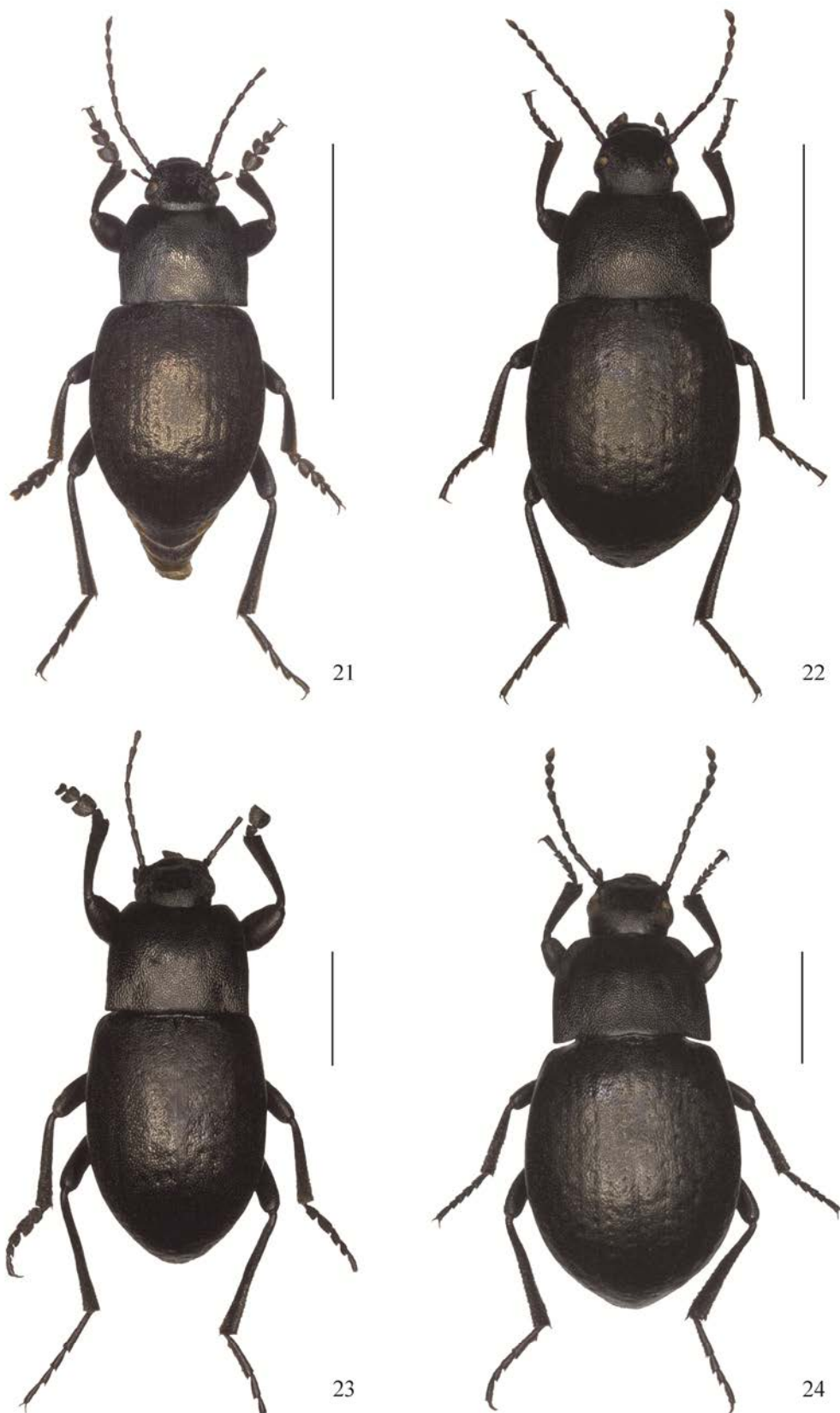
Diagnosis. The new species is close to *B. (C.) championi* (Reitter, 1891) but can be distinguished by the following characteristics: pronotum widest at base, anterior angles sharp, and posterior angles rectangular, whereas in the latter, widest in the middle or before the middle, anterior angles acute, and posterior angles sharp or acute; elytra of the new species with incompletely line of punctures, whereas complete in the latter; the paramere distinctly constricted before the widest of base by the dorsal view, weakly highlight by the ventral view, whereas not constricted in the latter.

Description. Length 11.1 mm, width 5.2 mm. Body brown with weak bronze shine; head and pronotum black-brown, legs, antennae, labial, maxillary palpi and abdomen puce; elytra with strong bronze shine.

Male (Figs 12–20, 23). Anterior margin of clypeus straight, clypeofrontal suture slightly concave, densely covered with fine punctures. Frons weakly and arcuately convex, sparsely covered with fine punctures. Genae slightly convex,



Figures 12–20. *Bioramix* (*Cardiobioramix*) *liupanshana* sp. nov., male. 12. Pronotum, dorsal view. 13–15. Pro-, meso- and metatibiae, dorsal view. 16–17. Meso- and metatarsi, dorsal view. 18–20. Aedeagus in dorsal, ventral and lateral views, respectively. Scale bars: 12–17 = 1.0 mm; 18–20 = 0.5 mm.



Figures 21–24. Habitus, dorsal view. 21–22. *Bioramix (Cardiobioramix) globipunctata* sp. nov., male and female. 23–24. *B. (C.) liupanshana* sp. nov., male and female. Scale bars: 21–22 = 5 mm; 23–24 = 2 mm.



Figures 25–30. Aedeagus in dorsal, ventral and lateral views. 25–27. *Bioramix (Cardiobioramix) globipunctata* **sp. nov.** 28–30. *B. (C.) liupanshana* **sp. nov.** Scale bar = 0.5 mm.

densely covered with punctures. Head densely punctate, covered with golden long setae. Eyes transverse, shallowly concave on anterior margin. Antennomeres II–X long cylindrical. Ratio of length (width) of antennomeres II–XI as follows: 17.9 (14.7):47.1 (17.1):29.6 (16.2):32.4 (13.3):30.2 (14.0):33.7 (13.5):32.9 (13.3):30.1 (14.1):31.5 (15.2).

Pronotum (Fig. 12) sub-rectangular, 1.3 times as wide as long, 1.7 times as wide as head, widest at base. Ratio of pronotal width on anterior margin to the maximum width and to the width at posterior margin is 1.8:2.5:2.7. Lateral sides distinctly constricted anteriorly at apical 1/3. Anterior margin distinctly concave, posterior margin almost straight. Anterior angles acutangular and posterior angles rectangular. Anterior and posterior margins bordered near lateral sides, and lateral margin with complete edge; disc punctures large and dense, densely covered with dust-like golden setae. Prosternal process weakly curved downwards, slightly sharp and rectangular at apex.

Elytra oblong, 1.4 times as long as wide, 1.4 times as wide as pronotum; widest in the base; disc finely wrinkled, punctures large and sparse; lateral margin deeply depression, border visible in dorsal view only in the middle, combined with epipleura, reaching near sutural angle; humeri rounded, covered with dust-like golden setae.

Profemur strong, sparsely covered with punctures and recumbent golden setae. Protibia gradually widened apically, inner side slightly curved, densely covered with recumbent short golden setae at apical 1/2; apex of ventral side without depression; outer side not blade-shaped. Protarsus distinctly widened apically; meso- and metafemora slender. Mesotibia gradually widened apically, densely covered with recumbent golden setae. Mesotarsus (Fig. 16) not strongly widened apically, narrower than the apex of mesotibia. Metatarsus almost straight, densely covered with recumbent golden setae. Ratio of lengths (widths) of pro-, meso- and metafemora is 1.5 (0.7):2.2 (0.5):2.7 (0.4), respectively, that of tibiae (Figs 13–15) is 1.7 (0.4):1.6 (0.3):2.4 (0.3); and ratio of width (length) of meso- and metatarsomeres I–IV (Fig. 17), respectively, as follows: 25.2 (33.6):31.5 (34.4):28.0 (26.0):22.0 (21.4), 21.1 (78.9):15.0 (41.6):15.0 (34.1):12.3 (50.2).

Abdomen sparsely covered with recumbent golden setae, anterior margin of visible sternum I wide and round, apical margin of visible sternum V wide and round, center of visible sterna I–II flattened.

Aedeagus (Figs 18–20) length 1.5 mm, width 0.5 mm. Parameres widest at base, constricted nearly straight at anterior, round and without sinuate at apex.

Female (Fig. 24). Body wider than male. Antennae shorter and reaching posterior to pronotum. Pronotum more transverse than male, approximately 1.3 times as wide as long. Pro- and mesotarsi simple.

Body length 12.1 mm, width 6.1 mm.

Type material. Holotype ♂ (antennae partly damaged; MHBU), China, Ningxia, Jingyuan, Woyangchuan, 8.VII.2008, leg. Xingpu Wang. Paratype. 1♀ (MHBU), China, Ningxia, Jingyuan, Xixia, 14.VII.2014, leg. Ling Bai.

Etymology. The name refers to the type locality.

Distribution. China (Ningxia).

Checklist of Chinese species of the subgenus *Bioramix* (*Cardiobioramix*)

(1) *Bioramix* (*Cardiobioramix*) *asidioides* Bates, 1879

Bioramix asidioides Bates, 1879: 479.

Platynoscelis (*Cardiobioramix*) *asidioides*: Kaszab, 1940: 193.

Bioramix (*Cardiobioramix*) *asidioides*: Egorov, 1990: 405.

Botiras punctatella Fairmaire, 1891: 99.

Type depository: The Natural History Museum, London, UK.

Distribution: China (Xinjiang), Kashmir, Pakistan.

(2) *Bioramix* (*Cardiobioramix*) *championi* (Reitter, 1891)

Helops championi Reitter, 1891: 226

Bioramix (*Cardiobioramix*) *championi*: Egorov, 2004: 654.

Helops subaenea Reitter, 1889: 710

Type depository: Hungarian Natural History Museum, Budapest, Hungary.

Distribution: China (Gansu).

(3) *Bioramix* (*Cardiobioramix*) *chinensis* (Kaszab, 1940)

Platynoscelis (*Cardiobioramix*) *chinensis* Kaszab, 1940: 197.

Bioramix (*Cardiobioramix*) *chinensis*: Egorov, 2004: 654.

Type depository: Collection of A. Schuster, Vienna, Austria.

Distribution: China (Sichuan).

(4) *Bioramix (Cardiobioramix) kabaki* Egorov, 2006

Bioramix (Cardiobioramix) kabaki Egorov, 2006: 794.

Type depository: Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

Distribution: China (Gansu).

(5) *Bioramix (Cardiobioramix) korschefskyi* (Kaszab, 1940)

Platynoscelis (Cardiobioramix) korschefskyi Kaszab, 1940: 196.

Bioramix (Cardiobioramix) korschefskyi: Egorov, 2004: 654.

Type depository: Collection of A. Schuster, Vienna, Austria.

Distribution: China (Sichuan).

(6) *Bioramix (Cardiobioramix) kulzeri* (Kaszab, 1960)

Platynoscelis (Cardiobioramix) kulzeri Kaszab, 1960: 91.

Bioramix (Cardiobioramix) kulzeri: Egorov, 2004: 653.

Type depository: Museum G. Frey, Tutzing, Germany.

Distribution: China (Sichuan).

(7) *Bioramix (Cardiobioramix) splendida* Egorov, 2006

Bioramix (Cardiobioramix) splendida Egorov, 2006: 789.

Type depository: Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

Distribution: China (Sichuan).

(8) *Bioramix (Cardiobioramix) subaenescens* (Schuster, 1923)

Platynoscelis subaenescens Schuster, 1923: 161.

Platynoscelis (Cardiobioramix) subaenescens: Kaszab, 1940: 195.

Bioramix (Cardiobioramix) subaenescens: Egorov, 2004: 654.

Type depository: Collection of A. Schuster, Vienna, Austria.

Distribution: China (Sichuan).

(9) *Bioramix (Cardiobioramix) szetschuana* (Kaszab, 1940)

Platynoscelis (Cardiobioramix) szetschuana Kaszab, 1940: 192.

Bioramix (Cardiobioramix) szetschuana: Egorov, 1990: 405.

Type depository: Senckenberg Deutsches Entomological Institute, Müncheberg, Germany; Collection of A. Schuster, Vienna, Austria.

Distribution: China (Sichuan).

Key to the species of *Bioramix (Cardiobioramix)* from China.

1. Pronotum widest at base.....2
Pronotum widest near the middle.....3
2. Pronotum with sparse or moderately dense round punctures on disc and oval on both sides.....*B. (C.) splendida* Egorov, 2006
Pronotum with dense oval punctures on disc and round on both sides.....*B. (C.) liupanshana* sp. nov.
3. Pronotum sub-rectangular, with setae4
Pronotum not sub-rectangular, without setae5
4. Punctures on pronotum large and dense, covered with fine dust-like setae.....*B. (C.) championi* (Reitter, 1891)
Punctures on disc of pronotum large, dense and oval-shaped, but larger, longer and combined on both sides, covered with densely golden long setae.....*B. (C.) globipunctata* sp. nov.
5. The visible ventrite V of male with a strumae on center*B. (C.) korschefskyi* (Kaszab, 1940)
The visible ventrite V of male complete6
6. Anterior angles of pronotum right-angled.....7
Anterior angles of pronotum obtuse-angled8

7. Pronotum widest behind middle, posterior angles sharp *B. (C.) szetschuana* (Kaszab, 1940)
 Pronotum widest in the middle, posterior angles rectangular *B. (C.) chinensis* (Kaszab, 1940)
8. Pronotum with large punctures 9
 Pronotum with small punctures 10
9. Elytra with sparse small punctures *B. (C.) asidioides* Bates, 1879
 Elytra with sparse large punctures *B. (C.) kabaki* Egorov, 2006
10. Punctures on pronotum sparse; and elytra widely oval-shaped *B. (C.) kulzeri* (Kaszab, 1960)
 Punctures on pronotum dense; and elytra elongate oval-shaped *B. (C.) subaenescens* (Schuster, 1923)

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References

- Bates, F. 1879. Characters of the new genera and species of Heteromera collected by Dr. Stoliczka during the Forsyth Expedition to Kashgar in 1873–74. *Cistula Entomologica*, 2 (1875–1882): 467–484.
- Egorov, L.V. 1990a. A contribution to the taxonomy of the tribe Platyscelidini (Coleoptera, Tenebrionidae), *Entomologicheskoe Obozrenie*, 69 (2): 401–412.
- Egorov, L.V. 2004. The classification of tenebrionid beetles of the tribe Platyscelidini (Coleoptera, Tenebrionidae) of the world fauna. *Entomological Review*, 84 (6): 641–666.
- Egorov, L.V. 2006a. New species of the Tenebrionid-beetle Subgenus *Cardiobioramix* Kasz., genus *Bioramix* Bat. (Coleoptera, Tenebrionidae, Platyscelidini), from the Chinese Provinces Gansu and Sichuan. *Entomological Review*, 86 (9): 1016–1023.
- Egorov, L.V. 2006b. On the distribution of the tenebrionid tribe Platyscelidini (Coleoptera, Tenebrionidae). *Cahiers Scientifiques du Muséum de Lyon*, 10: 139–142.
- Egorov, L.V. 2008. Tribe Platyscelidini Lacordaire, 1859. In: Löbl, I., Smetana, A. (eds.), *Catalogue of Palaearctic Coleoptera. Vol. 5 Tenebrionoidea*. Apollo Books, Stenstrup. pp. 291–297.
- Egorov, L.V. 2009. *Darkling beetles of the tribe Platyscelidini (Coleoptera, Tenebrionidae) of the world: morphology, zoogeography, system. Meetings in memory of N.A. Chlodkovsky. Iss. 61(1)*. St. Petersburg: Zoological Institute of RAS. 122pp.
- Fairmaire, L. 1891. Descriptions de Coléoptères des Montagnes de Kashmir. *Comptes-Rendus des Seances de la Société Entomologique de Belgique*, 88–103.
- Kaszab, Z. 1940. Revision der Tenebrioniden-Tribus Platyscelini (Col. Teneb.). *Mitteilungen der Münchener Entomologischen Gesellschaft*, 30: 119–235.
- Kaszab, Z. 1960. Die Tenebrioniden Afghanistans, auf Grund der Ergebnisse der Sammelreise des Herm J. Klapperich in den Jahren 1952/53 (Col.). 1. Fortsetzung und Schluss. *Entomologische Arbeiten aus dem Museum Frey, G.*, 11: 1–179.
- Li, Y.C., Egorov, L.V., Shi, A.M. 2013. Two new species of the genus *Bioramix* Bates, 1879 (Coleoptera: Tenebrionidae: Platyscelidini), from the Chinese Provinces Sichuan and Tibet. *Caucasian Entomological Bulltin*, 9(1): 89–94.
- Ren, G.D., Yu, Y.Z. 1999. *The darkling beetles from deserts and semideserts of China*. Hebei University Publishing House, Baoding. 395pp.
- Ren, G.D., Liu, C.L. 2009. Phylogenetic analysis of Chinese genera of the tribe Platyscelidini (Coleoptera: Tenebrionidae) based on the characteristics of defensive glands. *Acta Entomologica Sinica*, 52(10): 1146–1155.
- Ren, G.D., Wang, X.P. 2010. Tenebrionidae. In: Ren G-D, *Fauna of invertebrata from Liupan Mountain*. Hebei University Publishing House, Baoding. pp. 141–212.
- Reitter, E. 1889. Insecta, a cl. G. N. Potanin in China et in Mongolia novissime lecta. XIII. Tenebrionidae. *Horae Societatis Entomologicae Rossicae*, 23: 678–710.
- Reitter, E. 1891. Coleopterologische Notizen. XLI. *Wiener Entomologische Zeitung*, 10: 226–228.
- Schuster, A. 1923. Neue Paläarktische Tenebrioniden (Coleopt.). *Wiener Entomologische Zeitung*, 40: 156–162.
- Yu, Y.Z., Zhang, D.Z., Ren, G.D. 2000. Identification of the larvae of common Tenebrionids of the Platyscelini tribe (Coleoptera) in North China. *Entomological Knowledge*, 37(3): 160–163.